

RACK MOUNTING INSTALLATION SYSTEM

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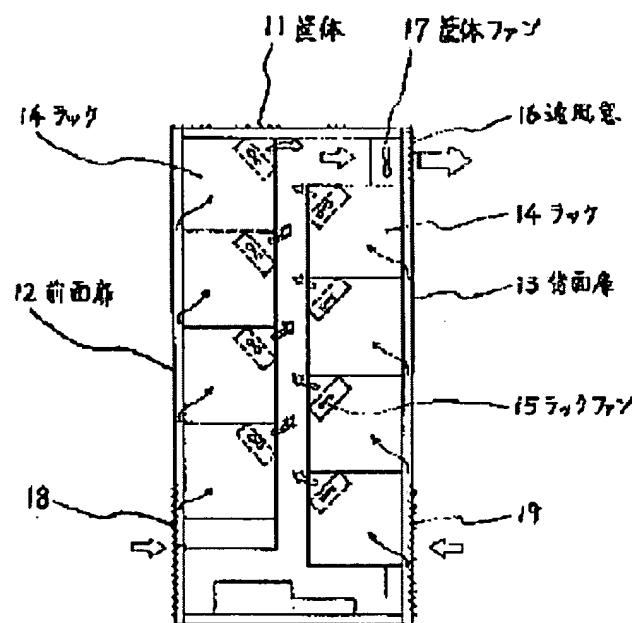
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Abstract of JP5160592

PURPOSE: To avoid a temperature rise of a rack device even if a fan of a rack is stopped by providing a fan for discharging obliquely backward and upward at each rack, and disposing a rack of a front face side and a rack of a back face side in a ununiform installation height longitudinally separately at a predetermined distance.

CONSTITUTION: When each rack fan 15 and a housing fan 17 are rotated, the air introduced from vent windows 18, 19 of a front surface door 12 and a back surface door 13 are introduced through the inside of a doors into each rack 14, discharged obliquely backward and upward, and externally discharged through a vent window 16 at an upper end of the door 13 by using the fan 17. Heat generated from the respective racks 14 is conveyed out of a housing 11 by the air flow to prevent a temperature rise of each rack 14 in the housing 11. If the fan 15 is stopped due to a trouble, the rack 14 of its back surface side opposed to the rack is ununiform in its installation height, and hence a temperature rise due to warm air of the device in the rack does not occur.



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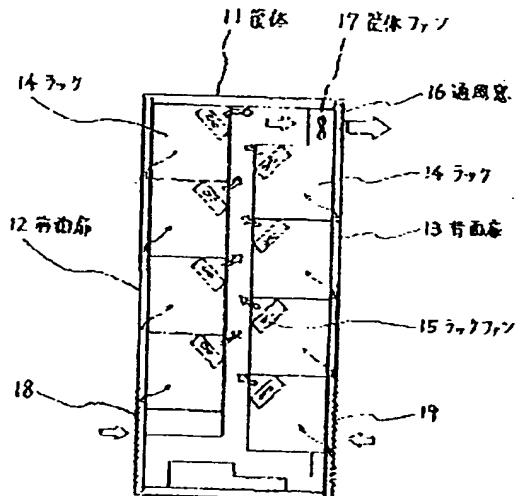
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(54)【発明の名称】 ラックマウント実装方式

(55)【要約】

【構成】 本発明のラックマウント実装方式は、筐体11の前面側と背面側との両側にそれぞれラック14をその前面を外に向か上下方向に複数段実装する場合、各ラック14にはその後詰め上方へ排気するラックファン15を設け、前面側のラック14と背面側のラック14とは設置高さをずらし且つ前後方向に所定寸法離間して配置したことを特徴とする。

【効果】 ある一つのラック14のラックファン15が故障を起こして停止しても、そのラックに対向しているラックは設置高さがずれているため、対向した側のラックから排出された暖かい空気がファンの停止しているラックに流入することがないので、ラックファンの停止したラック内の機器の暖気による温度上昇が起らない。したがって、本発明のラックマウント実装方式による筐体では、ラックのファン停止が発生してもそのラックの機器の温度上昇を回避でき、電子部品の劣化や装置の誤動作等の不具合を防止できる。



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【特許請求の範囲】

【請求項1】筐体の前面側と背面側との両側にそれぞれラックをその前面を外に向か上下方向に複数段実装する場合、各ラックにはその後斜め上方へ排気するファンを設け、前面側のラックと背面側のラックとは設置高さをずらし且つ前後方向に所定寸法離間して配置したことを持続とするラックマウント実装方式。

【発明の詳細な説明】

【0001】

【産業上の利用分野】本発明は、各種プラントにおける計装制御盤などの筐体内へのラックマウントの実装方式に関する。

【0002】

【従来の技術】従来、筐体の前面側と背面側との両側にそれぞれラックを複数段実装する場合、図2に示すようになっていた。すなわち、筐体1の前面扉2および背面扉3にそれぞれ前面を向けて複数のラック4が高さを揃え、且つ前後方向に所定寸法離間して積み重ねられて配置されていた。各ラック4には、その後斜め上方へ排気するラックファン5が設けられており、筐体1内の頂部には、背面扉3上端部の通風窓6へ排気する筐体ファン7が設けられている。また、前面扉2および背面扉3の各下部には、通風窓8、9が設けられている。

【0003】各ラックファン5および筐体ファン7が回転しているときには、前面扉2および背面扉3の通風窓8、9から流入した空気は、各扉の内側を通って矢印で示すように各ラック4に入り、ラックファン5により後斜め上方へ排出され、前面側のラックと背面側のラックの間の空間を上へ向って流れ、筐体1内の頂部に設けられた筐体ファン7により背面扉3上端部の通風窓6を経て外部へ排出される。この空気流により、各ラック4で発生した熱が筐体外へ逃げ、筐体1内の各ラック4の温度上昇を防いでいる。

【0004】しかしながら、例えば、前面側の最下段のラック4のラックファン5が故障で停止した場合、そのラック4と同じレベルにある背面側の最下段のラック4のラックファン5から出た暖められた空気が、駆除で示した矢印のように、ラックファン5の停止している前面側最下段のラック4に流れ込み、ラック内の機器を逆に暖めてしまうという欠点があった。

【0005】

【発明が解決しようとする課題】上記従来技術の欠点に鑑み、本発明は、ラックファンに故障が発生した場合でも、そのラックへ暖められた空気が入ることがなく、ラック内の機器の温度上昇を防げるラックマウント実装方式を実現することを目的とする。

【0006】

【課題を解決するための手段】本発明のラックマウント実装方式は、筐体の前面側と背面側との両側にそれぞれラックをその前面を外に向か上下方向に複数段実装する

場合、各ラックにはその後斜め上方へ排気するファンを設け、前面側のラックと背面側のラックとは設置高さをずらし且つ前後方向に所定寸法離間して配置したことを持続とする。

【0007】

【作用】本発明のラックマウント実装方式においては、各ラックのファンにより暖められた空気はラックの後斜め上方へ排出され、前面側のラックと背面側のラックとの間の空間の經突効果で筐体上部へ流れ、筐体ファンを介して外部へ排出される。そして、ある一つのラックのファンが故障を起こして停止しても、そのラックと対向しているラックは設置高さのずれがあるため、このラックのファンによる排気が前記ファンの停止したラックへ流入しないので、暖められた空気によるラック内の機器の温度上昇が起らない。

【0008】

【実施例】以下、図面に示した実施例に基いて本発明を詳細に説明する。

【0009】図1に本発明のラックマウント実装方式の

20 一実施例を示す。図1において、筐体1の前面扉2および背面扉3にそれぞれ前面を向けて複数のラック14が、前面側のラック14は最上位のものが筐体1の天井に近接している高さに4段、背面側のラック14は正面側のラックよりほぼラック単体の高さの半分だけ低くなった高さに4段というように設置高さをずらし、且つ前後方向に所定寸法離間して積み重ねられて配置されている。

【0010】各ラック14には、その後斜め上方へ排気するラックファン15が設けられている。また、筐体1

39 の背面側のラック14の最上位のものの上の空間には筐体ファン17が設けられており、背面扉3上端部の通風窓16を介して外部へ排気するようになっている。さらに、前面扉2および背面扉3の各下部には、通風窓18、19が設けられている。

【0011】上記のように構成された本発明一実施例のラックマウント実装方式による筐体においては、各ラックファン15および筐体ファン17が回転しているときには、前面扉2および背面扉3の通風窓8、19から流入した空気は、各扉の内側を通して矢印で示すよ

49 うに各ラック14に入り、ラックファン15により後斜め上方へ排出され、前面側のラックと背面側のラックの間の空間の經突効果で上方へ流れ、筐体1内上部に設けられた筐体ファン17により背面扉3上端部の通風窓16を経て外部へ排出される。この空気流により、各ラック14で発生した熱が筐体1外へ逃げ、筐体1内の各ラック14の温度上昇を防いでいる。

【0012】そして、ある一つのラック、例えば、前面側最下段のラック14のラックファン15が故障で停止した場合、そのラックに対向している背面側のラック14は設置高さがずれているため、そのラック14から排

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| (22) Date of application 06 December 1991 | (72) Inventor |
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(54) (TITLE OF THE INVENTION) Rack Mount Mounting System

(57) (ABSTRACT) [Constitution] The rack mount mounting system according to the present invention is characterized by the provision of a rack fan 15, for exhausting air to the diagonal upwards direction to the back of each rack 14, when racks 14 are installed in a plurality of ranks in the vertical direction with the front surfaces thereof facing towards the outside on both the front side and the back side of a housing 11, and the disposition of said front side racks 14 and said back side racks 14 with a specific dimensional spacing in the front-back direction, and with the installation heights thereof offset from each other.

[Effects] Even when a rack fan 15 within a given rack 14 fails and stops, the temperature is not increased by the heated air of the device within the rack for which the rack fan has stopped because the rack that is facing that rack is installed with an offset in respect to height so that the heated air exhausted from the rack on the facing side does not flow into the rack for which the fan has stopped. Consequently, in the housing according to the rack mount mounting system as set forth in the present invention it is possible to avoid increases in temperature of the devices in the rack, even when a rack fan stoppage has occurred, thereby making it possible to avoid problems such as

deterioration of electronic components and malfunctions of devices.

[INSERT FIGURE]

- 12: Front door
- 14: Rack
- 11: Housing
- 17: Housing fan
- 16: Ventilation window
- 14: Rack
- 13: Back door
- 15: Rack fan

[Patent Claims]

[Claim 1] A rack mount mounting system wherein, when a plurality of ranks of racks are installed on both the front side and the back side of a housing in the vertical direction, with the front surfaces thereof facing towards the back, a fan for exhausting air in the diagonal upwards backwards direction is installed in each rack, where the racks on the front side and the racks on the back side are disposed with a specific dimensional spacing therebetween in the front-back direction, and with the installation heights thereof offset from each other.

[Detailed Explanation of the Invention]
[0001]

[Field of Industrial Utilization] The present invention relates to rack mount mounting systems in housings, such as in instrument control panels in a variety of different plants.

[0002]

[Prior Art] Conventionally, when racks are installed in a plurality of ranks on both the front side and the back side of a housing, the mounting is performed as shown in Fig. 2. That is, the heights of a plurality of racks 4 are lined up, with the front surfaces thereof facing the respective front door 2 and back door 3 of a housing 1, and are disposed stacked on top of each other with a specific dimensional spacing in the front-back direction. A rack fan 5 for exhausting air in the diagonal upwards direction towards the back is equipped in each of the racks 4, and a housing fan 7, for exhausting air through a ventilation window 6 that is equipped at the top edge part of the back door 3, is provided at the top part within the housing 1. Moreover, ventilation windows 8 and 9 are provided at each of the bottom parts of the front door 2 and back door 3.

[0003] When each of the rack fans 5 and the housing fan 7 are rotating, the air that flows in through the ventilation windows 8 and 9 of the front door 2 and the back door 3 enters into each of the racks 4, as shown by the arrows, through the inside of each of the doors, and is exhausted in the upwards diagonal direction towards the back by the rack fans 5 to flow towards the top in the space between the front side racks and the back side racks to pass through the ventilation window 6 at the top edge part of the back door 3 to be exhausted to the outside by the housing fan 7 that is installed at the top part within the housing 1. This airflow conveys the heat that is generated in each of the racks 4 to the outside, thereby preventing increases in temperature in each of the racks 4 within the housing 1.

[0004] However, there has been a shortcoming in that, if there were a failure causing the rack fan 5 in a rack 4 at the lowest rank on the front side, for example, to stop, the heated air that is expelled by the rack fan 5 of the rack 4 on the bottommost rank on the back side at the same level as that rack 4 will flow into the rack 4 at the bottommost rank at the front side for which the rack fan 5 is stopped, as shown by the dash-line arrow, so that the devices within that rack will be heated instead.

[0005]

[Problem Solved for the Present Invention] In consideration of the aforementioned shortcoming in the conventional technology, the object of the present invention is to provide a rack mount mounting system that can prevent increases in temperature in the devices within a rack, without heated air flowing into the rack, even when a failure has occurred in the rack fan.

[0006]

[Means for Solving the Problem] The rack mount mounting system according to the present invention is characterized in that a plurality of ranks of racks are installed on both the front side and the back side of a housing in the vertical direction, with the front surfaces thereof facing towards the outside, a fan for exhausting air in the diagonal upwards direction towards the back is installed in each rack, where the racks on the front side and the racks on the back side are disposed with a specific dimensional spacing

therebetween in the front-back direction, and with the installation heights thereof offset from each other.

[0007]

[Effects] In the rack mount mounting system as set forth in the present invention, the heated air is exhausted in the upper diagonal direction towards the back by each rack fan and flows to the top part of the housing by the chimney effect of the space between the front side racks and the back side racks, to be exhausted to the outside through the housing fan. Given this, even if a failure were to occur causing a given rack fan to stop, there is an installation height offset between that rack and the facing rack so that the exhaust by the rack fan [of the facing rack] does not flow into the rack for which the aforementioned fan has stopped, and thus there is no increase in temperature of the devices within the rack due to the heated air.

[0008]

[Embodiments] The present invention will be explained in detail below based on the example of embodiment shown in the figure.

[0009] Fig. 1 illustrates one example of embodiment of a rack mount mounting system as set forth in the present invention. In Fig. 1, a plurality of racks 14, with the front surfaces thereof facing the front door 12 and back door 13 of a housing 11 are disposed stacked on top of each other so that the racks 14 on the front side are disposed in 4 ranks at a height wherein the highest rack 14 thereof is in proximity to the ceiling of the housing 11, and the racks 14 on the back side are disposed in 4 ranks with heights that are offset essentially one half rack unit heights lower than the racks on the front side, with a specific dimensional spacing therebetween in the front-back direction.

[0010] Each rack 14 is provided with a rack fan 15 for exhausting air in the upwards diagonal direction therebehind. Moreover, a housing fan 17 is equipped in the space above the rack 14 that is at the highest position on the back side of the housing 11, so that air is exhausted to the outside through a ventilation window 16 at the top edge part of a back door 13. Moreover, ventilation windows 18 and 19 are provided on the bottom parts of each of the front door 12 and back door 13.

[0011] In the housing in the rack mount mounting system in the example of embodiment according to the present invention, structured as described above, when each of the rack fans 15 and the housing fan 17 are rotating, the air that flows in through the ventilation windows 18 and 19 in the front door 12 and the back door 13 enters into each of the racks 14 through the inside of each of the doors, as shown by the arrows, and is exhausted in the diagonal upwards direction towards the back by the rack fans 15 to flow upwards due to the chimney effect of the space between the front side racks and the back side racks, to be exhausted to the outside through the ventilation window 16 at the top edge part of the back door 13 by the housing fan 17 that is equipped at the top part within the housing 11. This airflow conveys the heat generated in each of the racks 14 to the outside of the housing 11, preventing increases in temperature of each of the racks 14 within the housing 11.

[0012] Moreover, if there is a failure causing the rack fan 15 of, for example, the rack 14 that is the lowest rank on the front side to stop, the height of installation of the rack

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14 on the back side, which faces this rack, is offset, so the hot air that is exhausted from that rack 14 does not flow into the rack wherein the fan has stopped, and thus there will be no increase in temperature, due to that hot air, of the devices within the rack for which the rack fan has stopped. Moreover, because the highest rank of the rack 14 on the front side is in proximity to the ceiling of the housing 11, the space in the vertical direction between the front racks and the back racks is in a form that is connected directly to the space that is above the rack at the highest rank of the back racks, wherein the housing fan 17 is installed, thereby increasing the chimney effect so that the upwards movement of the hot air in the space in the vertical direction is increased, where this aspect also suppresses the influx of hot air into the rack wherein the rack fan has stopped.

[0013] In this way, even if a rack fan stoppage were to occur within a housing as set forth in the rack mount mounting system of the example of embodiment according to the present invention, it is still possible to avoid increases in temperature of the devices of the rack, and thereby preventing problems such as deterioration of the electronic components and malfunctions of devices.

[0014] [Effects of the Invention] In the present invention, as explained in detail above, a plurality of ranks of racks are installed on both the front side and the back side of a housing in the vertical direction, with the front surfaces thereof facing towards the outside, a fan for exhausting air in the diagonal upwards direction towards the back is installed in each rack, where the racks on the front side and the racks on the back side are disposed with a specific dimensional spacing therebetween in the front-back

direction, and with the installation heights thereof offset from each other so that even if a failure were to occur causing a given rack fan to stop, there is an installation height offset between that rack and the facing rack so that the hot air exhaust through the rack fan of the facing rack does not flow into the rack for which the aforementioned fan has stopped, and thus there is no increase in temperature due to the heated air in the devices within the rack for which the rack fan is stopped. Consequently, even if a rack fan stoppage were to occur within a housing as set forth in the rack mount mounting system of the example of embodiment according to the present invention, it is still possible to avoid increases in temperature of the devices of the rack, and thereby preventing problems such as deterioration of the electronic components and malfunctions of devices.

[Simple Explanation of Drawings]

[Fig. 1] A schematic side view diagram of a housing according to one example of embodiment of a rack mount mounting system as set forth in the present invention.

[Fig. 2] A schematic side view drawing of a housing according to a conventional rack mount mounting system.

[Explanation of Codes]

- 11: Housing
- 12: Front door
- 13: Back door
- 14: Rack
- 15: Rack fan
- 16: Ventilation window
- 17: Housing fan
- 18: Ventilation window
- 19: Ventilation window

[FIG. 1]

- 12: Front door
- 14: Rack
- 11: Housing
- 17: Housing fan
- 16: Ventilation window
- 14: Rack
- 13: Back door
- 15: Rack fan

[FIG. 2]

- 2: Front Door
- 1: Housing
- 4: Rack
- 3: Back door
- 5: Rack fan

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